

# STUDY ON YIELD, YIELD PARAMETERS AND TUBER QUALITY OF (ORANGE FLESH) SWEET POTATO (*IPOMOEA BATATAS*. L.) CULTIVARS

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## ABSTRACT

An experiment was conducted on seven oranges fleshed sweet potato cultivars at Central Agricultural University, Imphal, Manipur during kharif season 2014, under rain fed condition. The tuber yield, tuber yield parameters and tuber quality were evaluated. The experiment was laid out in randomized block design with three replications. The results of the experiment revealed that among the seven entries of sweet potato, CIPSWA-2 produced highest tuber yield ( $37.09 \text{ t ha}^{-1}$ ) and the marketable tuber yield of ( $444.48 \text{ g plant}^{-1}$ ), which was statistically at par with IGSP-15 ( $36.46 \text{ t ha}^{-1}$ ) and ( $436.32 \text{ g plant}^{-1}$ ) respectively, of the fresh tubers the starch content was found to be greater in CIPSWA-2 (24.53%) and carotene content was recorded highest with a value of ( $7.67 \text{ mg } 100 \text{ g}^{-1}$ ) in ST-14 which was followed by CIPSWA-2 ( $4.43 \text{ mg } 100 \text{ g}^{-1}$ ). The cultivars CIPSWA-2 and IGSP-15 proved to be superior with respect to yield and yielding parameters and performed well producing quality tubers and can be recommended for cultivation.

**KEYWORDS:** Sweet Potato, Tuber Yield, Starch & Carotene

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## INTRODUCTION

The sweet potato (*Ipomoea batatas* (L.) Lam.) is a herbaceous dicotyledonous perennial plant, grown primarily as a root crop. The crop is well established around the world, developed within the prehistoric civilizations of Central and South America (O' Brien, 1972). In the future sweet potato may well be grown in space, as suggested by preliminary ground-based experiments (Mortley, *et al.* 1998), conducted on behalf of the US National Aeronautics and Space Administration (NASA) and China's sweet potato experiments, undertaken in space using recoverable satellites (Guangqinet *al.* 2002). Among, the tropical tuber crops, sweet potato (*Ipomoea batatas* L. Lam) produces more edible energy even on marginal lands, when compared to other major food crops. It is an important starchy food crop of the tropical and subtropical country. It plays an important role in the economy of poor households. Cultivars having orange-fleshed tubers are rich source of  $\beta$  carotene, which is a precursor of vitamin A. Hence, the Evaluation for identification of high yielding cultivars, with better quality is the need of the hour.

## MATERIALS AND METHODS

Seven orange flesh cultivars of sweet potato viz., ST-14, S-1156, SV-362, IGSP-15, CIPSWA-2, NFSP-1 and Gouri were grown in the experimental field of Central Agricultural University, Imphal, Manipur during the kharif season 2014. The soil of this zone is clay loam in nature, with pH in the range of 5.24 to 6.14. The mean temperature in summer is  $30^{\circ}\text{C}$ , with an average annual rainfall of 1212mm. The experimental site is located at

24.8146° N latitude, 93.8903° E longitude, with an elevation of 728 m MSL. The experiment was laid out in randomized block design, with three replications. Apical vine cuttings of 20 cm length were planted at a spacing of 60 x 20 cm, in plots of 2.4 x 1.4 m size, accommodating 28 plants per plot. FYM @ 12.5 t ha<sup>-1</sup> and chemical fertilizers, to supply NPK @ 50:25:50 kg ha<sup>-1</sup> were applied. Half N and full P and K were given, as basal and the rest were applied at 30 days after planting. Plant protection and weeding was done, as per package of practices recommendation. The observation of the yield attributing characters and total tuber yield, were recorded at harvesting (120DAP) and statistically analyzed, as per (Gomez and Gomez, 1984). As for qualitative evaluation the dry matter (DM) content was worked out as the dry weight of tubers per fresh weight x 100, dry weight of tubers was recorded as the oven dried yield at 60 ±2°C to a constant weight. The total nitrogen content (%) of the tubers was analyzed as per Microkjeldahl's method, sugar content and starch content was analyzed by following the Anthrone reagent method, as described by Thimmaiah (2006) and β-carotene content was calculated as per according to Muststpspha and Babura (2009).

## RESULTS AND DISCUSSIONS

### Yield and Yielding Parameters

In the orange flesh sweet potato cultivars at harvest, as shown in table 1, the maximum tuber diameter was recorded from NFSP-1 (6.50 cm), which was at par with CIPSWA-2 (5.87cm), Gouri (5.83 cm), IGSP-15 (5.67 cm) and SV-362 (5.50 cm), whereas the minimum was recorded from S-1156 (3.84 cm) and ST-14 (4.90 cm). The maximum tuber length (14.40 cm) was recorded from the treatment SV-362 and was at par with Gouri (13.67 cm), NFSP-1 (13.17 cm) and IGSP-15 (13.13 cm) and the minimum tuber length (12.23 cm) was recorded in S-1156. The production of significantly more tubers per plant (2.90) in CIPSWA-2, led to the highest tuber yield per hectare (37.09 tha<sup>-1</sup>), which was statistically at par with IGSP-15 (36.46 ha<sup>-1</sup>). The minimum tuber yield per hectare was obtained from S-1156 (18.84 t ha<sup>-1</sup>). This result was in conformity with the findings of Sarkar *et al.* (1992), Shirkeet *al.* (2002) and Gin *et al.* (2008), in sweet potato. The magnificent increase in the yield might be attributed to the high resume of carbohydrate and large leaf area for better exposure to available sunlight. The increase in number of tubers per plant has a direct and positive effect on yield of sweet potato (Chen *et al.*, 1995). Similar results were reported in cassava (*Manihotesculenta*Crantz), by Balakrisnan and Thamburaj (1993).

### Tuber Quality Parameters

The data for quality parameters as presented in table 2 shows that, the tuber dry matter was found maximum in SV-362 (30.98 %), which was statistically at par with Gouri (30.49 %) and the minimum was recorded in CIPSWA-2 (21.75 %). The storage root nitrogen content was the maximum in CIPSWA-2 (0.97 %) which was significantly higher than the rest of the treatments; the minimum was found in ST-14 (0.57 %). The starch content of tubers was also highest in CIPSWA-2 (24.53 %) which was significantly higher than the rest of the treatments, followed by IGSP-15 (21.53 %) and the minimum was obtained from NFSP-1 (16.54 %). The high sugar content of the tuber was recorded from CIPSWA-2 (3.94 %) which was statistically at par with ST-14 (3.73 %), IGSP-15 (3.54 %) and NFSP-1 (3.49 %) and the minimum sugar content was recorded from S-1156 (3.29 %). The tuber β-carotene content was more in ST-14 (7.67 mg/100g), which is followed by CIPSWA-2 (4.43 mg/100g). The minimum β-carotene content (2.39 mg/100g) was found in S-1156 tubers. This result was in conformity with the findings of Padmajaet *al.* (2005), Chattopadhyayet *al.* (2002) and Saikiaet *al.* (2009). The dry matter of sweet potato tuber ranged from 19.9 to 45.4% and the fresh weight basis starch content ranged from 11.1 to 33.5% (Brabetet *al.*, 1998) and the fresh weight basis sugar content ranged from 1.64 to 4.46

% as reported by Chattopadhyay *et al.*, 2002).

## CONCLUSIONS

Although SV-362 was superior to all cultivars, in terms of tuber length and tuber dry matter, NFSP-1 registered the maximum diameter (6.50 cm) and weight of tubers. Production of significantly more tubers per plant (2.90), in CIPSWA-2 led to the highest total yield (37.09 t ha<sup>-1</sup>), closely followed by IGSP-15 (36.46 t ha<sup>-1</sup>). The tuber quality of CIPSWA-2 was superior to all cultivars in terms of starch, total sugar and root nitrogen; although the  $\beta$ -carotene content was slightly lower than that in ST-14. From the studies, it can be concluded that CIPSWA-2 and IGSP-15 for orange flesh sweet potato which have high tuber yield per hectare and with desirable tuber quality can be grown under Manipur condition.

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**Table 1: Yield and Yielding Parameters of Orange Flesh Sweet Potato Cultivars at Harvest (120 DAP)**

| Treatments | Tuber Diameter (cm) | Tuber Length (cm) | No. Of Tubers Per Plant | Single Tuber Weight (g) | Tuber Yield Per Plant (g) | Tuber Yield Per Plot (g) | Tuber Yield (tha <sup>-1</sup> ) |
|------------|---------------------|-------------------|-------------------------|-------------------------|---------------------------|--------------------------|----------------------------------|
| ST-14      | 4.90                | 11.37             | 2.16                    | 108.33                  | 232.94                    | 6522.19                  | 19.44                            |
| S-1156     | 3.84                | 12.23             | 2.30                    | 98.13                   | 225.82                    | 6323.01                  | 18.84                            |
| SV-362     | 5.50                | 14.40             | 2.80                    | 116.34                  | 325.78                    | 9121.70                  | 27.18                            |
| IGSP-15    | 5.67                | 13.13             | 2.70                    | 159.17                  | 436.62                    | 12225.36                 | 36.46                            |
| CIPSWA-2   | 5.87                | 12.93             | 2.90                    | 153.68                  | 444.48                    | 12445.48                 | 37.09                            |
| NFSP-1     | 6.50                | 13.17             | 1.43                    | 168.32                  | 240.50                    | 6733.91                  | 20.07                            |
| Gouri      | 5.83                | 13.67             | 2.77                    | 137.49                  | 382.98                    | 10723.38                 | 31.96                            |
| SE (d)     | 0.56                | 0.58              | 0.27                    | 11.62                   | 58.07                     | 290.41                   | 1.07                             |
| C. D 0.05  | 1.21                | 1.27              | 0.59                    | 25.32                   | 126.53                    | 632.81                   | 2.32                             |

**Table 2: Study on Quality Parameters of Orange Flesh Sweet Potato Cultivars**

| Treatments | Dry Matter % | Storage Root Nitrogen % (Dry Weight Basis) | Starch Content % (Fresh Weight Basis) | Sugar Content % (Fresh Weight Basis) | β-carotene mg100g <sup>-1</sup> (Fresh Weight Basis) |
|------------|--------------|--|---------------------------------------|--------------------------------------|--|
| ST-14      | 24.16        | 0.57                                       | 17.26                                 | 3.73                                 | 7.67   |
| S-1156     | 22.69        | 0.83                                       | 18.69                                 | 3.29                                 | 2.39   |
| SV-362     | 30.98        | 0.73                                       | 17.42                                 | 3.32                                 | 3.40   |
| IGSP-15    | 22.23        | 0.83                                       | 21.53                                 | 3.54                                 | 3.57   |
| CIPSWA-2   | 21.75        | 0.97                                       | 24.53                                 | 3.94                                 | 4.43   |
| NFSP-1     | 23.35        | 0.80                                       | 16.54                                 | 3.49                                 | 3.00   |
| Gouri      | 30.49        | 0.73                                       | 17.78                                 | 3.31                                 | 2.85   |
| SE (d)     | 0.89         | 0.05                                       | 0.53                                  | 0.25                                 | 0.29   |
| C. D 0.05  | 1.96         | 0.12                                       | 1.17                                  | 0.56                                 | 0.63   |